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***Know More About***  
***JAUNDICE***

*Know More About*  
**JAUNDICE**

**Dr. R. S. K. Sinha**



**VIGYAN PRASAR**

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**Know More About JAUNDICE**  
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## **FOREWORD**

This is one of a set of publications brought out by Vigyan Prasar in connection with the celebrations of the National Science Day (NSD) in 1995 for which the focal theme was "Science for health". The idea originally was to quickly come out with several small books or booklets on familiar health topics of everyday interest to the common people, written by well-known practicing doctors specialising in those areas. But since things did not happen 'quickly' enough to meet the NSD deadline, a decision was taken to reorient this effort and the concept of a "Vigyan Prasar Health Series" was born.

This volume titled "Know More About Jaundice" by Dr. R.S.K. Sinha, Senior Physician at the Safdarjung Hospital in New Delhi, deals with an ailment which is quite widespread. A very common way that jaundice is caused or triggered is via a viral infection in the liver which can result from water-borne diseases. And because of problems of good and clean drinking water, in many parts of the country, the numbers suffering from this disease are quite significant. The problem assumes epidemic proportions especially during the rainy season and in flood affected areas. But that's not the only way jaundice is caused.

In the accompanying pages, the author has attempted very aptly to describe the ailment, its various forms, factors thought responsible for causing and/or aggravating it and various ways of coping with it in real life, alongside different approaches to its treatment and management.

One hopes that readers, in particular those, who have seen or known someone close to them suffer from this ailment would be able to benefit through a better understanding of the underlying causes and an appreciation of the basic philosophy behind its medical care and control.

**Suggestions not only in respect of this and other volumes in the series, but also on additional topics for inclusion, would be most welcome.**

**New Delhi**

**Narender K. Sehgal**  
**Director**  
**Vigyan Prasar**

## **PREFACE**

In the last decade we Indians have been witnessing frequent and virulent outbreaks of jaundice in our cities in both the poor and affluent areas. In spite of all the new affluence and the medical advances the last decade has seen, in city after city, chilling new variations of jaundice are affecting and killing thousands of our citizens or else rendering them chronically ill. But still most of us remain largely ignorant about its whys and wherefores. A good book on this common, dangerous, but largely curable disease was, badly needed for both the lay-persons; as also young doctors, who have to deal with this pernicious scourge of our times with increasing frequency.

Various factors are responsible for the sad state of our citizens' health today. These range from our own terminal ignorance of health matters, to a vast growth of polluted slums and unauthorised out-city land developments, antiquated water supply and sewage systems, and a slothful, nasty and work-resistant culture among our civic bodies. As the world shrinks into an interconnected global mass, a further great biological melange has been set into motion and many dangerous microbes of long isolated areas are also being stirred into the national pool. Surely it is time now for all of us to see how we can understand and counter all these old and new challenges to our well-being.

Our doctors and health experts have long been concerned and keen that the public understand the phenomena of communicable diseases, so that they take precautionary measures and also pressurise the governments into preventing their outbreaks. What was needed was a clear, simple and informative insight from experts, into health matters. I'm sure Dr. RSK Sinha's handbook on jaundice provides such an insight.

**Mrinal Pande**



# 1

## JAUNDICE -- A SIGN OF DISEASE

**T**he most common cause of jaundice the world over is a viral infection of the liver. Some of these infections are more prevalent in developing countries while others, for example, Hepatitis-B, are more common in affluent societies where sex and drug abusers mainly spread the virus. In a study, nearly 150,000 individuals were found to have suffered from hepatitis in India in the year 1983, out of which 1,925 lost their lives. By the age of five about 90 per cent of children in India show evidence of past hepatitis infection. A large number of them never develop jaundice, the ratio being as high as 12:1. It has been estimated that there are atleast 200 million carriers of Hepatitis-B virus in the world. These are the largest source of infection to their sexual partners and to unsuspecting individuals who receive blood donated by professional blood donors amongst them. In India, about 30-40 per cent of all viral hepatitis cases are likely to be due to hepatitis B virus. Out of these 5 to 15 per cent become carriers of the infection. In infants who develop Hepatitis-B infection, over 50 per cent become carriers. Another type of viral infection of liver commonly termed as non A - non B hepatitis was first reported in India in Kashmir where it affected a population of nearly 600,000 in a short span of 4 to 7 weeks. This type of infection affects predominantly young adults. It is more severe in pregnant women in whom it is associated with very high mortality.

As 'fever' could just be a sign of several underlying diseases like influenza, tonsillitis, malaria, typhoid, tumours

like cancers, etc.; or as 'anaemia' could be a sign of any chronic disease like tuberculosis, malignancy, nutritional deficiency, worm infestation, bleeding piles etc.; 'jaundice' too is just a manifestation of several other diseases. These diseases may or may not involve the liver. Jaundice could be present at the time of birth or can occur later. It could be mild and may not cause symptoms like jaundice of newborns; or severe enough to endanger life. It could even run in families. It can occur in an epidemic form or may involve only one individual; it may involve only very close contacts of the sick or may spread to a whole town. The disease may not require any treatment or may even require operation for cure. Some of the causes of jaundice are preventable, while nothing can be done to prevent the occurrence of the disease in certain other cases. Jaundice can even occur owing to the bad effects of some drugs or to addiction to alcohol.

Liver is an organ which helps in digestion and its weakness has been attributed in our Ayurveda as the cause of several diseases. However, we know now that weakness or failure of liver may cause indigestion of fat but appearance of jaundice at some stage of the disease is mandatory. The commonly conceived idea of 'liver tonics' as a remedy for failure to thrive, to stimulate appetite or to improve digestion does not have any scientific basis.

\* \* \*

## LIVER -- THE ORGAN

**L**iver is the largest organ in the body, weighing 1200-1500g in adults situated in the abdomen on right side below the rib cage. It has two lobes--right and left. The right lobe is larger in adults whereas in infancy the left lobe is relatively large, contributing to the protuberant abdomen at that age. The total blood flow to liver is normally about 1.5 lit/min. and it has mainly two types of cells -- one which helps in digestion (hepatocytes) and the other which helps in excretion and body defense (Kupffer's cells).

The secretion of liver, i.e., bile, is collected by small ducts and brought to a pouch situated just at the base of liver, the gall bladder. Gall bladder stores and concentrates the bile which is released into the proximal part of intestinal tract (duodenum) through a common duct (common bile duct) whenever required to digest fat (Fig. 1).

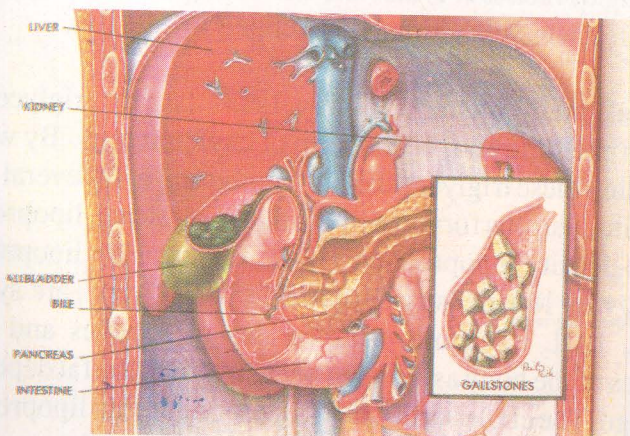


Fig. 1 : Anatomy of liver and gall bladder

**Its functions:** Liver carries out a variety of metabolic functions facilitated by the rich blood supply to it. These metabolic functions involve the metabolism of carbohydrates, proteins and fats.

**Carbohydrate metabolism:** The liver is the most important organ for maintenance of normal blood glucose concentration in the body. It has the capability to store and release glucose. The liver converts glucose and various other kinds of carbohydrates in blood to glycogen and stores it for future use. When exogenous carbohydrate is not available, the blood glucose concentration is maintained by endogenous glucose production, 90 per cent of which is derived from the liver by the breaking of glycogen or conversion of protein into glucose. Stored glycogen gets exhausted within about 24 hours of fasting.

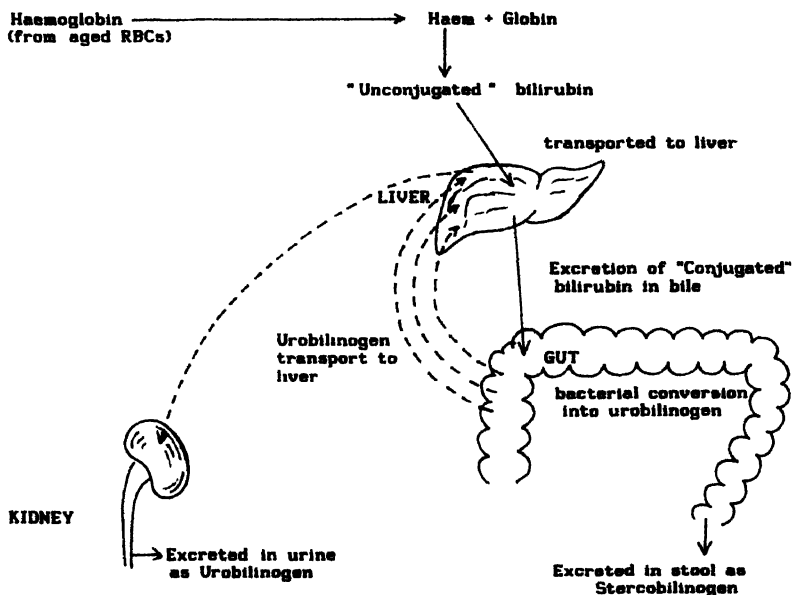
**Protein metabolism:** The synthesis of several proteins and their export into the blood is a major liver function. It manufactures most of the important proteins like fibrinogen, prothrombin, labile and stable factors, etc., necessary for clotting of blood. It is also the site of degradation of proteins into urea which is ultimately excreted by kidneys.

**Fat metabolism:** Dietary fat is largely triglycerides which enter the body in the form of chylomicrons. By way of breaking these triglycerides and combining with several other proteins, various forms of lipids like cholesterol, lipoproteins (high-density lipoproteins HDL, low-density lipoproteins LDL, very low-density lipoproteins VLDL) etc., are synthesized. LDL transports triglycerides to muscles and other tissues of the body as a source of energy or to the fat depots for storage. The cholesterol can be incorporated into lipoproteins, converted into bile acids or excreted into the bile.

Besides the metabolism of various food and energy components, liver also secretes bile which directly helps in digestion, assimilation and absorption of fat and fat-soluble vitamins from intestine. The bile consists bile acids and bile pigment, called bilirubin.

**Bilirubin:** When red blood cells which contain haemoglobin undergo breakdown after they have outlived, they produce most (80 per cent) of the bilirubin. As Bilirubin is not water-soluble, it cannot be passed into the urine. It is taken up by the hepatocytes of liver where it is combined with glucuronic acid and excreted into the bile. The latter form of bilirubin is conjugated and is water-soluble (Chart 1).

Chart 1: Synthesis of Bilirubin



The advantage of such a conversion is that the conjugated bilirubin can no more be absorbed by intestine and it has only one fate, i.e., degradation by the naturally occurring bacteria in the large bowel. By degradation another form of bilirubin, stercobilirubinogen, is formed which is mostly excreted into the stool (100-200 mg/day) giving faeces its usual yellow colour. Some of this stercobilirubinogen gets absorbed by the intestine, from where it reaches the liver and most of it is re-excreted into bile but some amount (4mg/day) passes through the liver and is excreted in urine, where it is known as urobilinogen.

**Bile acids :** Bile acids are essential for emulsification of fat in the proximal parts of intestine so as to make them suitable for assimilation and subsequent absorption. These bile acids which are derived from cholesterol in the liver and excreted into the duodenum in the form of bile are mostly reabsorbed by the liver. So, there is hardly any need for fresh synthesis of bile acids, which is required only to compensate the daily loss.

Insufficiency of the bile acids results in poor absorption of dietary fat and fat-soluble vitamins, notably vitamins D and K. Such deficiency may result from impaired synthesis in chronic liver disease, biliary obstruction and loss of bile acids into the colon and in disease of terminal part of the large intestine. The last one causes intractable diarrhoea.

**Vitamin and Hormone metabolism :** Some vitamins like A, D, K, B<sub>12</sub> and folate are stored in the liver. In addition, vitamin K is required by the hepatocytes for production of various clotting factors in the blood.

Many hormones including thyroxin, steroid hormones and sex hormones like oestrogen are metabolised and inactivated.

**Drug metabolism :** Most of the drugs, once they have performed their functions, need to be excreted out of the body through urine or stool. In this process of drug metabolism, liver plays the most important role. As these drugs are mostly fat-soluble, their conversion into a water-soluble form by the liver, makes this process of excretion simple.

In liver disease, therefore, drug metabolism may be impaired, and care is needed to avoid overdosage, particularly with sedative drugs. The extent to which individual drugs are affected is variable and cannot be predicted. Special care should, be taken whenever there is hepatic damage.

\* \* \*

# 3

## LIVER FUNCTION TESTS (LFT)

**T**he term 'liver function tests' refers to a group of biochemical investigations useful in confirming that the liver is diseased, in indicating whether hepatic cells or the biliary tree is primarily involved, in giving an indication to the extent of liver damage and in assessing progress. Liver function tests are variably abnormal in various liver diseases but normality of all the commonly used tests does not always prove that the liver is normal.

Following are some of the important tests which are commonly used to assess the liver function.

**Bilirubin :** The normal level of bilirubin in serum (blood) is 0.3-1.0 mg/100ml.

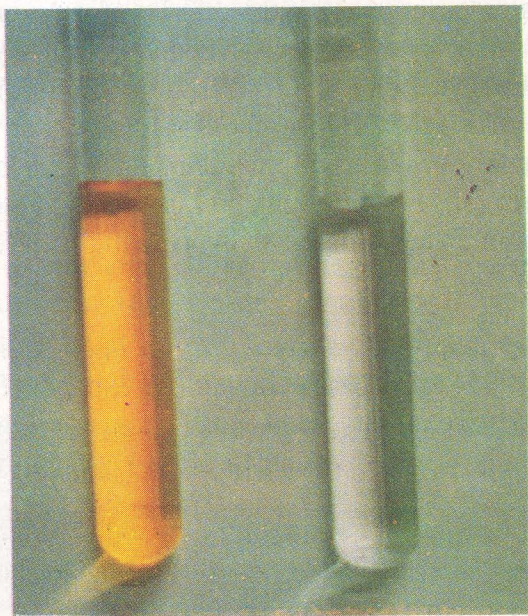
As explained in the previous chapter, bilirubin in the blood of a healthy person is invariably unconjugated and its level may be high mainly for two reasons. First, when there is increased production due to the rapid destruction of RBCs. Second, owing to defect in liver cells leading to failure of conjugation or transport of unconjugated bilirubin for such a purpose. The first condition is most commonly observed in a newborn where there is rapid destruction of RBCs at the time of birth and as the child grows the high levels of bilirubin start falling. The levels become normal in a few weeks. The other rare causes of rapid destruction could be by-birth defects in RBC which lead to haemolytic anaemia. This type of disorder often needs a very aggressive treatment.

The second cause of increased unconjugated bilirubin in



blood is mostly genetic where there is a mild rise in bilirubin without causing any trouble to the individual.

Diseases of liver cells or of the outflow tract for bile raise the level of conjugated bilirubin. As conjugated bilirubin is water-soluble, it can be excreted in high quantities through urine, giving it dark yellow colour (Fig.2).



**Fig. 2 : Dark coloured urine in jaundice (left)**

**Urobilinogen :** Estimation of urobilinogen in urine is a simple test, both to detect jaundice and to rule out any obstruction in the outflow tract for bile. As explained earlier, any increase in the blood levels of bilirubin will lead to a proportionately higher production of urobilinogen in urine. However, in case of inability of bile to reach intestine, production of stercobilinogen is not possible and the formation of urobilinogen is also impaired. Hence, in cases where a person has jaundice but whose urine does not contain

sufficient urobilinogen, the possibility of obstruction should be kept in mind.

The best time for urine examination to estimate urobilinogen is afternoon.

**Other blood test:** Liver cells contain many enzymes which may be released into the blood in various pathological processes. Measurement of the activity of these enzymes in the blood may give evidence of liver disease and of its general nature. Enzymes like SGOT (serum glutamic oxaloacetic transaminase) and SGPT (serum glutamic pyruvic transaminase) which are normally present in the blood of healthy persons in a range of 5-40 units/lit may get increased by 2 to 100 times in acute diseases of liver owing to infections or toxicity of drugs.

Another commonly assayed enzyme in serum is alkaline phosphatase. Normal serum contains 40-100 units/lit of alkaline phosphatase activity. However, it increases if there is any obstruction to the free passage of bile from the liver.

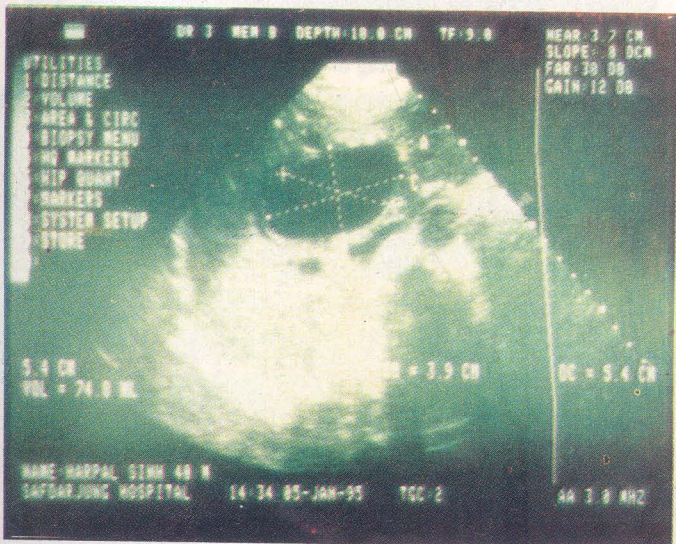
Although there are several other blood tests which form the part of the liver function tests yet they are not usually required in the case of jaundice.

\* \* \*

## OTHER PROCEDURES IN LIVER DISEASES

**B**esides the various blood and urine tests described earlier, some tests or procedures may be required to ascertain the cause of jaundice in a few cases. These may be blood tests to directly or indirectly detect the viruses which might cause jaundice. These tests will be described in later chapters.

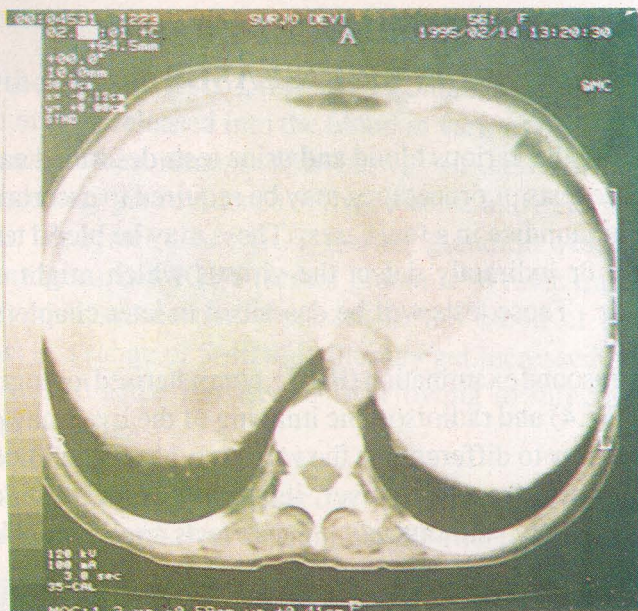
Ultrasound examination (Fig.3), computerised tomography (CT) (Fig.4) and radioisotopic imaging of the liver may often be necessary to differentiate the various types of jaundice and also to assess the size of liver, its morphology, presence or absence of any tumour, etc. These tests can be applied to



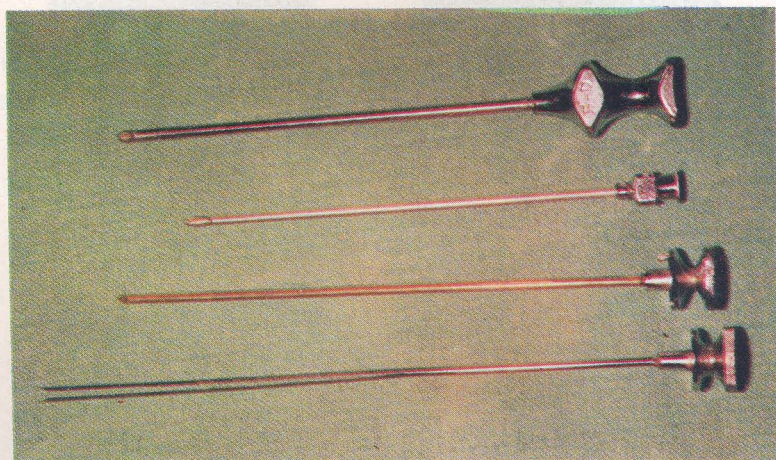
**Fig. 3 : Ultrasound of liver showing a large abscess**



examine the gallbladder, its size and function, and presence of any stone or obstruction in the outflow tract of bile which may lead to jaundice.



**Fig. 4 : CT Scan showing marked enlargement of liver**



**Fig. 5 : Liver biopsy needle**

Invasive tests like liver biopsy are rarely required, and such tests could be hazardous especially in cases of deep jaundice. But in a long-standing (over six months) case of jaundice, it becomes an essential test. Liver biopsy is done in a hospital after admitting the patient where he is observed for some days after the test. Prior to liver biopsy, certain tests are conducted, the most important being the coagulation/clotting tests. If any abnormality is observed in these tests, either biopsy is deferred or arrangements for blood transfusion are kept handy. Biopsy is done using a sharp needle (Fig.5) and the liver piece is sent for microscopic examination. This test helps in determining accurately the extent of the liver damage and in further treatment.

**\* \* \***

## **JAUNDICE -- HOW TO IDENTIFY?**

**J**aundice is a term referring to the yellowness of the skin and mucous membranes resulting from an increased bilirubin concentration in the body fluids. It is detectable when the serum bilirubin concentration exceeds 3 mg/100ml. In colloquial Hindi, the disease is termed differently as 'peeliya' or 'kanwar.' The yellow colouring of the skin and mucous membrane is different from the pallor of anaemia, with which it is often confused. The pallor of anaemia occurs owing to deficiency of haemoglobin which gives pinkish tinge to the skin and the mucous membrane. Hence, in anaemia the skin including nails, palms and soles and mucous membrane like lips, tongue, conjunctiva, etc., lose their normal reddish-pinkish shade but do not have any discolouration.

The yellow colour of jaundice can best be seen over the scleral conjunctiva (thin transparent membrane which covers the white sclera of eye ball). It can also be seen over the hard palate. In very severe cases, even the skin including gray hair can show yellowish colouration.

Besides yellow colouration of body, a patient suffering from jaundice invariably passes highly dark-coloured urine which is darkest during afternoon. This dark colouration of urine should not be mistaken for concentrated urine. In the latter, which is mostly seen during hot weather, the darkness of urine fades away gradually in the day and following intake of plenty of water.

Even the stool of these patients is usually dark-coloured, except in certain types of jaundice where the stool colour

changes into light clay . In a person who has jaundice and passes clay-coloured stool, obstruction in the biliary passage is suspected.

Owing to excessive deposition of bile pigments especially in cases of severe obstructive jaundice, patients experience marked itching all over the body. In such cases even the body secretions like sweat are coloured yellow, which may leave behind a yellow stain over the bed sheet.

**\* \* \***

# 6

## WHAT CAUSES JAUNDICE?

**V**arious mechanisms which lead to excessive rise of bilirubin in blood have been discussed in previous chapters. However, causes of jaundice can be broadly grouped into three types, depending upon the defects:

- (1) **Pre-hepatic:** where the defect is mainly in the excessive production of bilirubin, the liver remaining normal and healthy.
- (2) **Hepatic:** where the defect lies in the liver itself; and
- (3) **Post-hepatic:** where the defect lies in the outflow tract of bile from the liver.

Based on the above group of causes, jaundice can be classified into :

- a) **Haemolytic jaundice** caused by pre-hepatic defects,
- b) **Hepatocellular jaundice** caused by diseases of the liver per se,
- c) **Obstructive jaundice** caused by biliary tract obstruction.

**Causes of Haemolytic Jaundice :** A healthy liver can excrete a bilirubin load six times greater than normal before unconjugated bilirubin accumulates in the blood. Jaundice due to haemolysis is usually mild. Exceptions to this occur in the new born where the liver is immature to handle the rapidly destroying red blood cells for a few weeks leading to the appearance of jaundice normally in an otherwise healthy child.



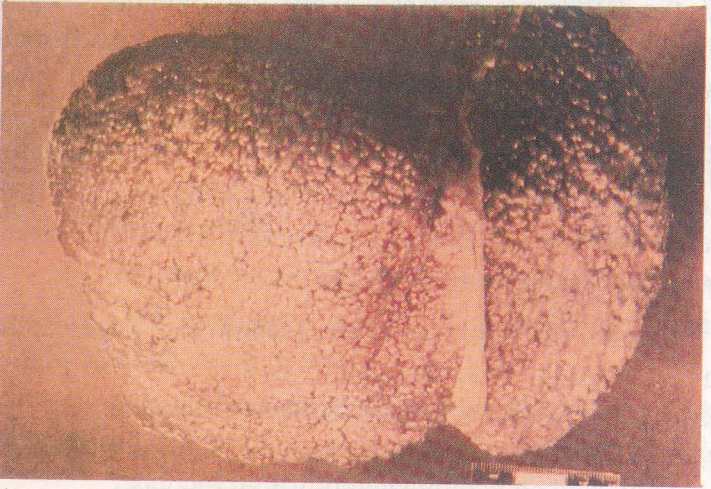
Red blood cells turnover is a normal physiological process, having an average survival of 120 days. This means that all the RBCs are replaced every four months. Various abnormalities either in the red blood cells or its environment may shorten its lifespan and require a more rapid replacement. Owing to the rapid destruction of these cells in the blood, there is an increase in unconjugated bilirubin in the blood and increased reabsorption of urobilinogen from the gut, this then being excreted in the urine in increased amounts. All these contribute to the features of classical jaundice.

**Causes of Hepatocellular Jaundice :** Hepatocellular jaundice results from the inability of the liver to transport bilirubin in the bile as a result of the liver cell damage. In this type of jaundice, the concentrations in the blood of both unconjugated and conjugated bilirubin increase.

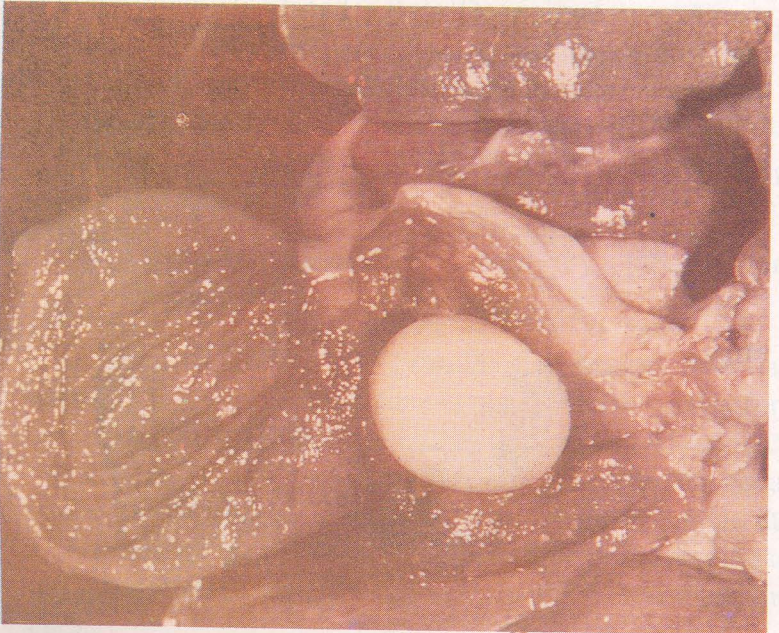
Acute infections of liver (i.e. hepatitis) usually due to virus or other organisms; toxins, usually drugs or alcohol are the common causes of hepatocellular jaundice. Chronic hepatitis (Fig. 6) and cirrhosis (shrunken liver) (Fig.7) can also cause jaundice.



**Fig. 6 : Massive destruction of liver**



**Fig. 7 : Shrunken liver (Cirrhosis)**



**Fig. 8 : Stone in gall bladder**



The severity of jaundice in hepatocellular jaundice ranges from mild to very severe.

**Causes of Obstructive Jaundice :** Obstructive jaundice occurs owing to stasis of bile caused by failure of bile flow. Its causes may lie anywhere between the hepatic duct and the duodenum. The concentrations of mainly conjugated bilirubin, unable to enter the biliary passage increase in the blood and cause jaundice.

The most common causes are impaction of a gall-stone in the common bile duct, cancer of pancreas or bile duct, stricture of bile duct. Other rare causes include severe infections, extensive advanced stages of cancer, pregnancy, etc.

\* \* \*

## **HAEMOLYTIC JAUNDICE**

**A**mongst the various causes of haemolytic jaundice, the important and common ones are listed in chart 2.

### **Chart 2: Causes of Haemolytic Jaundice**

#### **1. Defect in Red Blood Cells**

- a) Hereditary -- by birth defects in the shape of red cells and/or abnormal haemoglobin, e.g., thalassemias, spherocytosis, etc.
- b) Acquired -- because of deficiency of vitamin B<sub>12</sub> and/or folic acid, etc.

#### **2. Defect outside Red Blood Cells.**

- a) Antibodies against red cells, e.g., Rh factor incompatibility in newborns.
- b) Physical injury to red cells, e.g., artificial (prosthetic) heart valves.
- c) Chemical injury, e.g., some drugs like sulfa drugs.
- d) Infections, e.g., malaria.
- e) Mismatched blood transfusion.

Certain features are common to all types of haemolytic jaundice. This type of jaundice is mild; the serum bilirubin is dominantly unconjugated and rarely exceeds 5 mg/100ml. Most patients have enlarged spleen and anaemia. Increased bilirubin excretion leads to more stercobilinogen in stool, which is therefore not pale, and to increased urobilinogen in

the urine as more of this substance is absorbed from the gut. The urine rapidly becomes deep yellow on standing. Other tests of liver function are normal.

Jaundice caused by mismatched blood transfusion may develop after a few hours of transfusion during which the patient may exhibit mild to very serious signs of reaction like fall in blood pressure, shock, fever up to 40° C, kidney failure, etc. In a majority of cases, if timely treatment is given, jaundice subsides in a few days and does not leave any permanent disability.

\* \* \*

# 8

## OBSTRUCTIVE JAUNDICE

**A**part from the manifestations of the causative disease, jaundice, which occurs owing to failure of bile flow may cause several other symptoms. If jaundice in these cases is prolonged and severe, skin becomes greenish in colour instead of yellow. Stool becomes pale or clay-coloured owing to deficiency of bilirubin in it. There is severe fat indigestion leading to large bulky motions containing undigested fat. Some patients have generalised itching, loss of appetite, or a metallic taste in the mouth. A large gall bladder which can be felt in abdomen in the presence of jaundice more often indicates cancer in pancreas. In long-standing obstructive jaundice, patient starts losing weight, develops increasing tendencies to bleed and pain due to bone disease.

\* \* \*

## HEPATOCELLULAR JAUNDICE

**T**he most common cause of hepatocellular jaundice is acute and rapid damage of liver cells which mostly occurs owing to viral infections. A list of some of the common causes is given in Chart 3.

### Chart 3: Causes of Hepatocellular Jaundice

1. Infections:
  - a) Viruses -- most commonly HAV (Hepatitis-A virus), HBV (Hepatitis-B virus), HCV (Hepatitis-C virus), HDV (Hepatitis-D virus or Delta virus), HEV (Hepatitis-E virus or epidemic non-A - non-B hepatitis).  
  
Other viruses, e.g., Cytomegalovirus, Epstein-Barr virus, yellow fever, etc.
  - b) Bacteria, e.g., Tuberculosis, Typhoid, etc.
  - c) Protozoa, e.g., Amoebae, Toxoplasma, Leptospira, etc.
2. Toxic substances, e.g., antituberculosis drugs and several other antidiabetic, antihypertensive, antibiotic drugs; alcohol, etc.
3. Circulatory Disturbances -- any form of circulatory shock (fall in B.P.), heart failure, etc.
4. Other conditions, e.g., pregnancy.

# 10

## VIRAL HEPATITIS

**V**iral hepatitis is typed on the basis of causative virus, e.g., A, B, C, etc. or its onset which can be acute, fulminant or chronic. It is one of the most common liver diseases in the tropics, particularly in the developing countries. The increasing population of the slums in cities and unsatisfactory socio-economic and hygienic conditions are among the factors contributing to the high incidence of viral hepatitis.

The various kinds of viral hepatitis have different modes of transmission, variable course of the disease and subsequent complications, varying incubation periods, etc., hence these will be discussed separately.

### Hepatitis - A

Acute type-A viral hepatitis, also called Epidemic or Infectious or Short Incubation Hepatitis, is caused by the Hepatitis-A virus (HAV).

**Characteristics of HAV :** HAV is a 27 nm RNA virus, classified as an enterovirus type 72 belonging to the picorna virus family. The nucleic acid of HAV is single-stranded RNA and till date, only a single serotype has been identified. Recently, the virus has been grown in tissue culture.

**Spread of infection :** It is highly infectious and is usually spread by human faeces, entering the body via oral route directly or indirectly. The virus is stable for several months at 4<sup>0</sup> C but can be inactivated by heating to 100<sup>0</sup>C for five minutes.



Patients suffering from Hepatitis-A are only transiently infectious. Infected persons may excrete viruses in the faeces for about 3 weeks before the onset of jaundice and for upto 2 weeks thereafter.

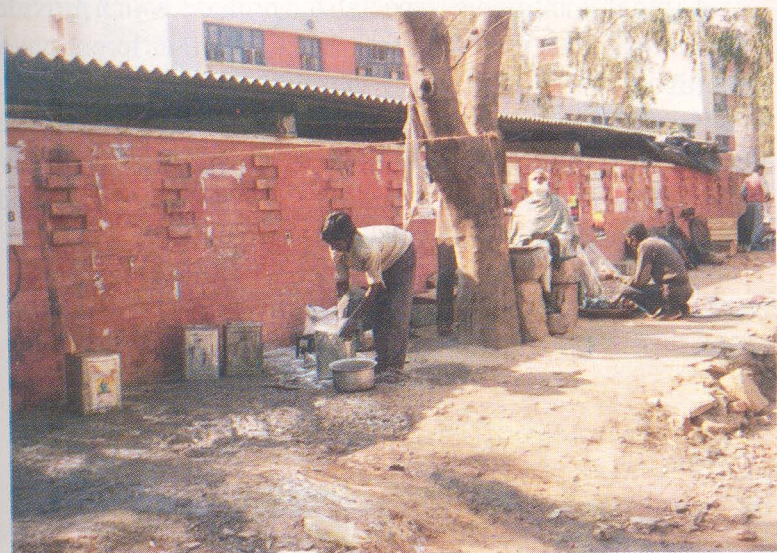


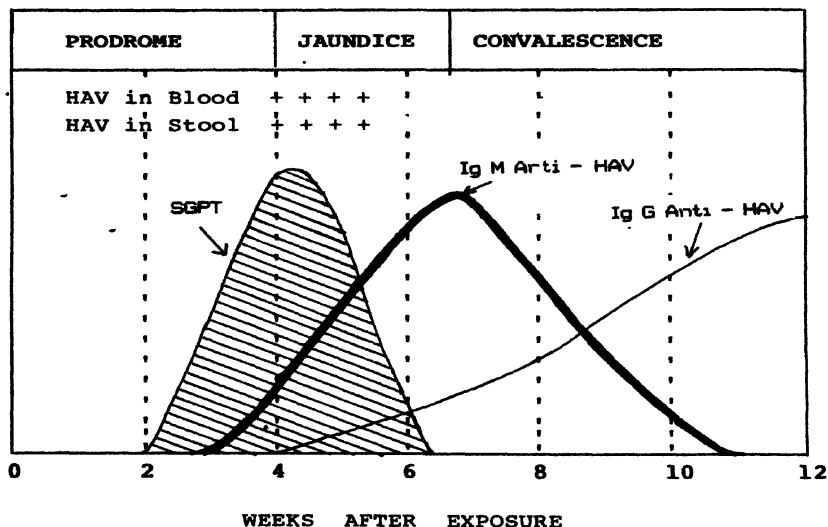
Fig. 9 : Insanitation spreads disease

Susceptibility to HAV infection increases linearly with age and bears an inverse correlation to socio-economic status. In India, about 90 per cent of the population have evidence of past exposure to HAV by adulthood. Children are most commonly affected and conditions of overcrowding, poor hygiene and sanitation favour the spread of this infection. In occasional outbreaks, water, milk and shellfish become the vehicles of transmission. The sources in the community appear to be persons incubating or suffering from the disease.

**Detection of virus :** Although viral activity has been demonstrated in blood, bile and stool, the most pragmatic diagnosis is by testing the serum for antibody to HAV. Faecal

shedding of the HAV occurs in the early phase of the illness. It is detected in stool in 50 per cent of patients during the first week of infection, in 25 per cent of patients during the second week, and only rarely in the third and the fourth weeks.

As regards antibodies (specialized proteins which provide immunity against the organism) to HAV, two different types of antibodies are found during the course of the disease. The IgM (Immunoglobulin-M) antibody appears during the acute phase and is detectable up to 4-12 weeks. Persistent anti-HAV IgG (Immunoglobulin-G) antibody is then detectable and confers immunity in the person (Fig. 10).



**Fig. 10 : Hepatitis - An infection**

**Incubation Period :** The period of actually developing the disease following the exposure to virus varies from 2 to 6 weeks.

**Features of the disease :** In most cases the Hepatitis - A disease is mild, self-limiting and anicteric (without any physical evidence of jaundice). There are usually three phases in this disease.

1. **Phase of Prodrome :** This phase of symptoms usually precedes the development of jaundice by a few days to two weeks. They are the usual manifestations of an acute infectious disease like headache, bodyache, malaise, fever with mild chill, etc. There is a marked loss of appetite. Distaste for cigarettes is common. During this period the patient may suffer from nausea, vomiting and diarrhoea. The patient may feel constant upper abdomen pain and if examined by a doctor, he may be found to be having enlargement of nodes in the neck. Some patients may have enlarged spleen too.
2. **Phase of Jaundice:** Dark urine and yellow tint to the scleral conjunctiva (eye) heralds the onset of jaundice. Gradually, the yellowish colouration of eyes deepens but the stool becomes paler, and urine remains dark throughout the period of jaundice. Conversely, with the onset of jaundice most of the prodromal symptoms as mentioned earlier including loss of appetite, start improving. The person may have enlarged liver during this period of jaundice.
3. **Phase of Convalescence:** After about 3 to 6 weeks the jaundice totally disappears, urine and stool regain their normal colour, and the liver enlargement regresses. However, the disease takes a longer course and is usually severe in adults.

**Laboratory Tests :** Various laboratory tests are conducted to clinch the diagnosis at the earliest, to know the severity of disease and to exclude other possibilities of jaundice. These include mainly the different Liver Function Tests (LFT) as mentioned earlier. Amongst these tests, the earliest abnormality is detectable in blood in the form of raised SGPT and SGOT. Their levels may even become as high as more than 600 units/100 ml even before the serum bilirubin, which causes jaundice, starts rising. Subsequently, serum bilirubin becomes high and may continue to rise even though the SGPT and SGOT levels in blood may start declining, suggesting the onset of recovery. Urine may show high concentrations of bile salts and bile pigments. Then starts a gradual development of immunity against the infection as exhibited by rise in IgM and IgG anti-HAV antibodies in the blood (Fig. 10) which also differentiates hepatitis-A infection from other causes of jaundice.

**Course and Outcome :** Nearly all the patients make full recovery. However, a very small number of patients develop recurrence of the above symptoms but in all these cases the relapse subsides spontaneously.

In some anxious patients, certain unrelated symptoms, however, continue for nearly 2 to 3 months even after complete recovery. These symptoms include upper abdominal discomfort on the right side, loss of appetite, nausea, malaise, etc. The only treatment for these symptoms is reassurance and psychotherapy.

Very rarely the patients of Hepatitis-A may develop alteration and loss of consciousness, known as 'hepatic encephalopathy', and have a fatal outcome. Fatality in adults is about 0.2 per cent and in elderly about 3 per cent.

**Treatment :** Viral Hepatitis - A does not have any specific therapy and in a majority of cases it is not required as well. However, some general measures do help in faster recovery from the symptoms besides better tolerance.

*Bed rest* is advisable. Specially, in cases of severe hepatitis it is certainly required. These patients should be allowed up to the toilet. This is also important for patients aged above fifty years and pregnant women. Isolation of these cases is usually not required but their excreta should be properly disposed off.

*Diet* should be nutritious and high in calorie. Initially these patients may be advised to have a light diet but supplemented with plenty of fruit juices and glucose. The type of food should be decided by the patient himself; however, it should contain good protein. Owing to intolerance, fatty meals should be avoided. If vomiting is severe, intravenous fluids and glucose may be required for a few days.

*Drugs* have no role in the recovery. However, several herbal preparations are being used extensively without any scientific evidence of their beneficial effects. Drugs like Essentiale, Hepamerz, Phospholip, etc. are claimed to be effective in early recovery.

Corticosteroid (Prednisolone), which is very often prescribed by unqualified medical practitioners, may be hazardous although it may cause an immediate sense of well being. Therefore, such drugs should best be avoided.

Other *drugs* which *should not be used* during hepatitis are any kind of sedatives, hypnotics, paracetamol, oral contraceptive pills. Intake of alcohol should be totally stopped for atleast six months.

**Prevention :** HAV infection can be effectively curtailed by measures emphasizing good sanitation and personal hy-

giene practices. The simplest method of destroying the virus from water is by boiling it. Hence, in an outbreak of the disease consumption of only boiled water and properly cooked and stored food stuff should be propagated. In reality, patients are not contagious in the early phase of the illness before definitive diagnosis is established. However, once the disease is recognised, contacts may be protected by immunization. This kind of protection is especially required for elderly patients, pregnant women, contact persons having some other serious disease.

As in the case of any immunization, it can be done by both active and passive methods. The passive method is simpler and cheaper. Passive immunization with regular injections of immune serum globulin is 80-98 per cent effective in preventing HAV infection. Recommendations for such a prophylaxis are given in Chart 4.

**Chart 4**

**Recommendations for Immune Globulin Prophylaxis of Hepatitis - A**

<b>Immunization</b>	<b>Dose per ml/kg body weight (Intramuscular injection)</b>
<b>After exposure</b>	
Close personal contacts (household and sexual)	0.02
Institutional contacts (prisons, day care centres, etc.)	0.02
<b>Before exposure</b>	
Travellers (susceptible) to tropical and developing countries	0.02 or 0.05 every 5 months during prolonged stay

As regards active immunization a Hepatitis - A vaccine has been recently licensed for use in Belgium, Austria, Switzerland and the U.K. The immunity is demonstrable in 95.8 per cent cases after first dose and 99.8 per cent after the second dose. An inexpensive vaccine that offers long-lasting protection is needed before it can be recommended for use in developing countries.

## **Hepatitis - B**

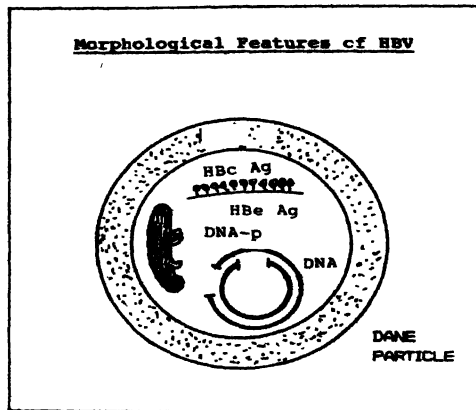
The Nobel prize (1976) winning discovery of 'Australia Antigen' by Dr. Blumberg opened up new vistas in the field of viral diseases and hepatitis. Blumberg's Australia Antigen was later known as Hepatitis-B surface Antigen (a component of Hepatitis-B virus, HBV: the causative organism of Hepatitis-B disease).

**Characteristics of HBV :** HBV is a DNA virus of 42 nm size. The virus and an excess of its capsular material circulate in the blood where it can be identified. There are three distinct components (antigens) of this HBV, also known as 'Dane particle', which are responsible for the disease as well as immunity to an individual. These are Hepatitis-B surface Antigen (HBs Ag), Hepatitis-B core Antigen (HBc Ag) and Hepatitis-Be Antigen (HBe Ag) [Figure 11].

The presence of HBs Ag in blood can be tested by several quick methods like ELISA test for HBs Ag, etc. Its presence indicates one of the three conditions:

- (i) the person is still in the incubation period of HBV infection;
- (ii) active HBV infection is present;

- (iii) a chronic carrier state where a person just carries the virus without any disease.



**Fig.11 : Morphological features of HB virus**

HBs Ag = Hepatitis B surface antigen

HBc Ag = Hepatitis B core antigen

HBe Ag = Hepatitis B e antigen

DNA-p = DNA polymerase

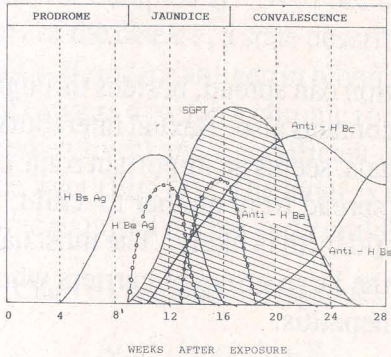
During the recovery from HBV infection, antibody against HBs Ag (Anti-HBs) and HBc-Ag (Anti HBc) appear in blood which offers a very long-term immunity to the person (Fig. 12).

As regards HBc Ag, it cannot be demonstrated in the blood since it lies in the liver cells where it produces disease. However, in contrast to HBs Ag, antibody against core antigen can be detected in serum before anti HBs antibodies (Fig.12). A positive anti HBc test generally signals active ongoing acute infection with HBV infection.

Hepatitis-Be antigen appears early, transiently, and universally in the serum of patients with acute HBV infection.

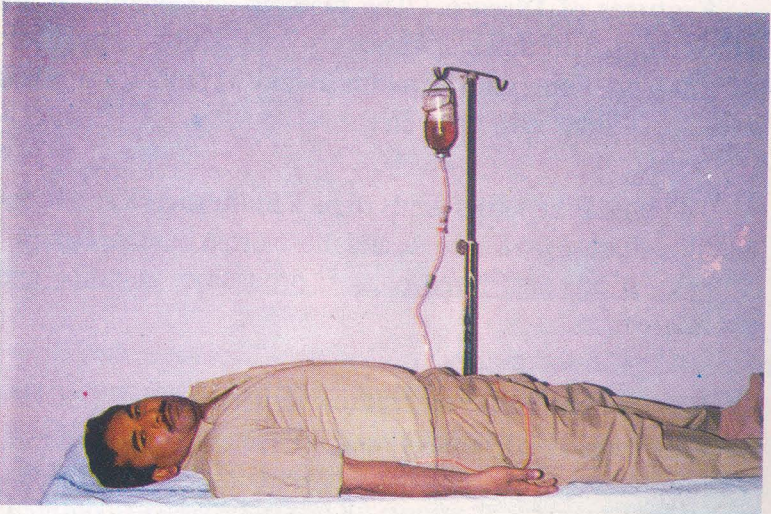


Therefore, the mere presence of this antigen does not correlate with severity or chronic duration of disease.



**Fig. 12 : Hepatitis-B Infection**

**Spread of Infection :** Blood and blood products are the main sources of infection. Spread may follow transfusion of infected blood or blood products or injections with contami-



**Fig. 13 : Blood transfusion from professional donors is a common source of hepatitis - B infection**

nated needles, a mode of spread most common among drug abusers who share needles for injecting drugs. Tattooing or acupuncture may also spread this disease as needles are reused frequently.

HBV infection can spread, besides through injections, by close personal contacts also. Sexual intercourse, especially in male homosexuals, seems an important route of transmission. The virus may spread from mother to child; transmission at or soon after child birth is likely. The most dangerous source of HB virus is the large group of carriers who do not exhibit any feature of hepatitis.

**Incubation Period :** The incubation period of HBV infection is quite long. It may extend from 50 to 180 days. During such a long incubation, the patient even tends to forget the contact or exposure.

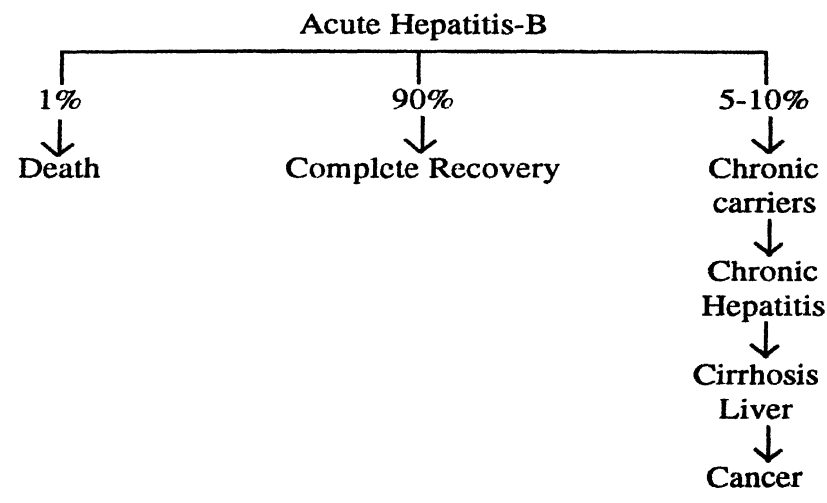
**Features of Disease :** The features of Hepatitis-B are almost similar to those of Hepatitis-A infection. However, most of the patients with Hepatitis-B may have joint pains and swelling besides skin rash, etc.

The type B hepatitis tends to be a more severe and long-duration disease than type A, and more often has late complications. It has also three phases: prodrome, jaundice and convalescence.

**Laboratory Tests:** Alterations in various liver function tests are similar to those found in Hepatitis-A infection. Various tests for detecting the antigen components of Hepatitis-B virus and their antibodies levels help identify the stage of disease.

**Course and Outcome :** Various outcomes of the viral Hepatitis-B are shown in Chart 5. About 1 per cent of patients seeking medical attention will have fulminant hepatitis, while 90 per cent recover completely. 5-10 per cent will become chronic carriers of the disease, a state described as the persistence of Hepatitis-B surface antigen in blood for more than six months. Some carriers develop a chronic form of hepatitis or cirrhosis (shrunken liver) and a significant number succumb to cancer of the liver (Fig.14). The latter is especially true if the infection was acquired during early childhood or infancy.

**Chart 5 : Sequelae of Hepatitis - B**



**Treatment and Prevention :** A number of agents, both herbal and nonherbal drugs, have been utilized as therapy in the treatment of patients with both acute and chronic Hepatitis-B. As discussed in the treatment of Hepatitis-A, dietary and drug treatment remains essentially similar in cases of Hepatitis-B, besides bed rest. However, in cases of chronic Hepatitis-B

infection, drugs like *corticosteroids*, *levimasole*, *interferon* and a plant derivative (*Phyllanthus amarus* -- a derivative in ancient Indian medicine for centuries) are used.

Post-transfusion Hepatitis-B infection can be largely prevented by scrupulous blood transfusion technique, using only voluntary donors amongst friends and relatives, and excluding those with a history of jaundice and by screening all blood for HBs Ag before transfusion. Sterile needles and syringes should be used always and if disposable equipment is not available, then the nondisposable syringes should be autoclaved for 20 minutes at 120°C.

As in the case of Hepatitis-A infection, Hepatitis-B infection can also be prevented by both active and passive immunization. The disease can be prevented or minimised by passive immunization through intramuscular injection of gamma-globulin prepared from blood containing anti-HBs. However, it should be given within a few days after needle prick or suspected exposure.

Active immunization for Hepatitis-B infection is now possible, by giving three injections of Hepatitis-B vaccine (Engerix - B). It is required to be administered at one and two months, intervals in case of definitive exposure, alongwith the gamma-globulin as described above. However, the third dose of this vaccine can be injected at six month's, interval in persons who are at a greater risk of contacting the disease, like medical laboratory workers, doctors, nurses, etc. In about 20 countries this vaccine has been included in universal vaccination programme of newborns and young children.



## Hepatitis-C

Viral hepatitis, distinct from hepatitis A,B,D or any other viral disease associated with hepatitis, was previously defined as “Non-A, Non-B hepatitis” (NANB). NANB was described in a variety of settings including patients who received blood transfusion and dialysis, intravenous drug users as well as in sporadic setting. After a decade and half of intensive research in many laboratories, the causative organism for NANB hepatitis was identified and cultured. This organism was recently designated as Hepatitis-C virus (HCV). HCV is a major cause of both acute and chronic hepatitis.

**Characteristics of HC virus :** Hepatitis-C virus is a RNA virus of 50-60 nm diameter and is supposed to be of flavivirus family.

**Spread of Infection :** The major factors in community-acquired HCV infection include blood transfusions, intrave-

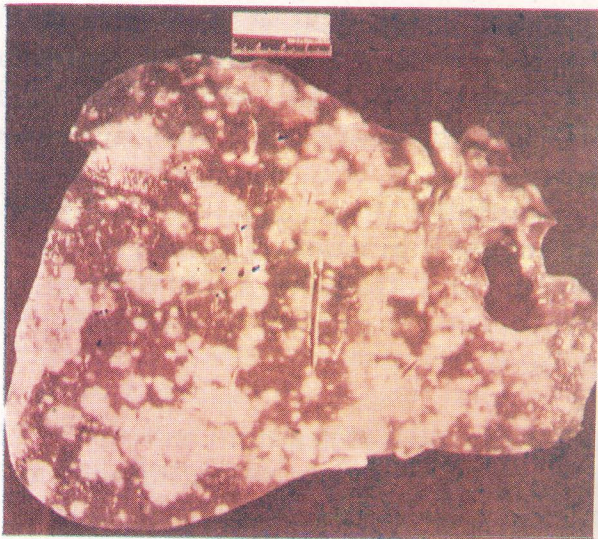


Fig.14 : Cancer of liver

nous drug abuse and inapparent skin exposures. Transmission through sexual contact or from mother is rare.

**Incubation Period :** The period from exposure to the onset of disease varies from 2 to 22 weeks.

**Features of Disease :** The features of acute Hepatitis-C are exactly similar to those of Hepatitis-A or Hepatitis-B and they are clinically indistinguishable.

**Laboratory Tests :** The changes in various liver function tests are similar to all other types of hepatitis. As regards identification of Hepatitis-C virus, its antibodies appear in blood in three months to one year period, which indirectly establishes the diagnosis.

**Course and Outcome :** Although most of the patients suffering from Hepatitis-C recover without any residual physical problem yet about 50 per cent cases end up into its chronic form as chronic hepatitis. A number of these patients who progress into chronic hepatitis gradually lead to shrunken liver (cirrhosis) over a 10-20 year period. As in the case of Hepatitis-B, some of these patients probably progress to cancer of liver.

**Treatment and Prevention :** Treatment of acute Hepatitis-C is similar to that of Hepatitis-A or B. However, in cases of chronic Hepatitis-C, a drug like alpha-interferon is being effectively used.

As a result prevention of Hepatitis-C infection, safe blood transfusion appears the only way out from this disease, which leaves behind several sequelae since immunization efforts have not achieved any success so far.

## **Hepatitis -D**

Hepatitis due to Hepatitis-B virus has often been observed to be associated with another virus, Hepatitis-D virus (HDV). Isolated hepatitis due to HDV is not seen. This type of concomitant obligatory association was discovered in the year 1977.

**Characteristics of HDV :** The Hepatitis-D virus, also known as "Delta virus", is also an RNA virus of 35 nm diameter.

**Spread, Features and Outcome :** Since it is an associated infection with Hepatitis-B infection, its spread and features are similar to those of Hepatitis-B. However, in the presence of Hepatitis-D virus the outcome of the disease is much worse. The mortality in acute Hepatitis-D increases to as high as 2 to 20 per cent. Nearly 75 per cent patients progress into cirrhosis once they develop chronic Hepatitis-D in comparison to 25 per cent cases of chronic Hepatitis-B.

**Laboratory Tests :** In the presence of HDV infection the liver function alterations show fluctuation, when there occurs a sudden upsurge in the SGPT and SGOT levels once they start a downward trend. The diagnosis of HDV infection can be confirmed either by demonstration of anti-HDV antibodies or by demonstration of delta virus in the liver cells by liver biopsy done in cases of chronic hepatitis.

**Treatment and Prevention :** There is no proven therapy for delta hepatitis. Even interferon therapy has not been found to be effective in controlling this disease. However, prevention of it appears to be simpler as the vaccine against Hepatitis-B is freely available and is being abundantly used all over the world. Thus, by preventing Hepatitis-B infection even the Hepatitis-D infection can be prevented.

## Hepatitis - E

Similar to Hepatitis-C infection, Hepatitis-E infection is a variant of non-A - non-B (NANB) hepatitis, the difference between the two being mainly in the route of infection. Hepatitis-E virus (HEV) spread by faeco-oral transmission like Hepatitis-A virus because of which it has been the cause of various large waterborne epidemics of hepatitis in the Indian subcontinent. A large waterborne outbreak occurred in Delhi in the winter of 1955-56. Recession of flood waters led to back-up of a large open drain and subsequent contamination of water supply. Almost 30,000 people were afflicted with jaundice. Since then, similar attacks in which thousands of individuals were affected have been described.

**Characteristics of HEV :** Hepatitis-E virus is also an RNA virus of 32-34 nm diameter similar to calci-viruses.



Fig. 15 : Contaminated water a source of viral hepatitis



**Spread of Infection :** As mentioned earlier, the Hepatitis-E virus spreads by faeco-oral route owing to the contamination of drinking water.

**Incubation Period :** The time of onset of disease from the time of exposure to HEV is 2 to 9 weeks.

**Features of Disease :** Besides large outbreaks of Hepatitis-E infection, it is also the commonest cause of acute hepatitis in sporadic cases occurring in endemic areas. Mostly people of 15-40 years of age are affected by this disease. It has a very high mortality rate (10-20 per cent) in pregnant women who suffer from Hepatitis-E. However, patients normally recover from the disease in a shorter period without leading to any carrier stage or chronic liver disease.

**Treatment and Prevention :** Treatment of all kinds of acute viral hepatitis is the same. However, the best way to protect against acquisition of this form of viral hepatitis is to avoid potentially contaminated food or water.

\* \* \*

## CHRONIC HEPATITIS

**T**s discussed in the previous chapter on acute hepatitis, some percentage of patients suffering from Hepatitis-B or C may develop chronic hepatitis instead of having complete recovery. However, it is important not to confuse gradually recovering acute hepatitis from chronic hepatitis. As there is no sure way to avoid this by clinical assessment or investigations, a diagnosis of chronic hepatitis should be made firmly once the liver disease has been present at least for six months.

There could be two kinds of chronic hepatitis -- chronic active hepatitis (CAH) or chronic persistent hepatitis (CPH). Whereas the chronic persistent hepatitis is usually a very slowly progressive disease, chronic active hepatitis has a certain fatal end if not treated in time.

The patients suffering from chronic persistent hepatitis usually complain of fatigue, loss of appetite, intolerance to fatty food and pain in the upper part of abdomen. However, patients suffering from chronic active hepatitis have marked problems like fever, joint swellings, pain and bleeding disorders.

Diagnosis of these disorders depends upon the duration of illness, alterations in liver function tests including liver biopsy.

These cases can be treated with corticosteroid, interferon, etc., which is given under strict medical supervision.

## CONCLUSION

**J**aundice caused by increase in bilirubin level in blood is a manifestation of several diseases which may or may not involve liver. There are three types of jaundice - haemolytic, hepatocellular or obstructive. Causes of haemolytic jaundice are mainly by-birth defects in the person's red cell, mismatched blood transfusion, toxic effects of drugs etc. Obstructive jaundice occurs because of obstruction of bile flow which may be inside the liver or outside, like cancer of pancreas. Viral infection is the most common cause of jaundice besides certain drugs. These viruses which cause hepatitis are hepatitis virus A,B,C,D & E. Viral hepatitis can be acute, chronic persistent and chronic active hepatitis. Acute Hepatitis-A & E spread by faeco-oral route owing to contaminated food and water. Large epidemics and outbreaks of acute hepatitis mostly occur because of Hepatitis-E. On the other hand, Hepatitis-B,C & D spread by close contacts, blood transfusion, use of infected needles, etc. Hepatitis B & C have a prolonged and severe course and very often lead to a symptom-free carrier state (source of infection), chronic hepatitis, cirrhosis or cancer of liver.

Acute viral hepatitis usually does not require any specific treatment. Only good nutritious diet and rest are essential for complete recovery.

Prevention of hepatitis is easy. Improved sanitation, hygiene, consumption of boiled water are the safe ways to avoid exposure to Hepatitis-A & E viruses whereas transfusion of

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